October 17, 2019

To: Chair Anderson and Members of the Pacific Fishery Management Council

RE: West Coast Pelagic Conservation Group Notice of Intent to re-apply for an Exempted Fishery Permit to continue an industry initiated collaborative research project

The West Coast Pelagic Conservation Group (WCPCG), has been working since 2017 in concert with the Southwest Fisheries Science Center (SWFSC) and the Washington Department of Fish and Wildlife (WDFW) to surveil coastal pelagic species (CPS) in nearshore northwest coastal waters.

This request for an exempted fishery permit (EFP) is submitted to continue and expand this industry-initiated collaborative research effort. The proposed project builds on successful proof of concept and gear strategy work in 2017 and 2019 by the WCPCG, SWFSC and WDFW to conduct nearshore surveillance of the coastal pelagic species (CPS) assemblage off Washington and Oregon. The PFMC previously approved this request in April 2019. There are two stages for the proposed project in 2020. The first stage continues the complementary acoustic surveying by the FV *Lisa Marie* to quantify the CPS assemblage in waters inaccessible to the NOAA FSV *Reuben Lasker*; the second stage to be conducted with the WDFW expands the proof-of-concept, adding new work to address sampling methodology concerns raised in reviews of the NOAA/SWFSC acoustic-trawl survey.

Accompanying the EFP proposal are attachments that outline the project's methodologies and preliminary summary of work accomplished by the *Lisa Marie* in 2019.

We thank you for this opportunity to further and enhance CPS research.

Sincerely,

Mike Okoniewski
Board Member
West Coast Pelagic Conservation Group

Proposal for an Exempted Fishery Permit

West Coast Pelagic Conservation Group
Collaborative "Proof of Concept Project" for Nearshore Surveillance Acoustic Trawl Methodology Survey of North West Coastal Waters

This proposal for an exempted fishery permit (EFP) is submitted to continue and expand an industry-initiated collaborative research effort. The proposed project builds on successful proof of concept and gear strategy work in 2017 and 2019 by the West Coast Pelagic Conservation Group (WCPCG), the NOAA Southwest Fisheries Science Center (NOAA/SWFC), and the Washington Department of Fish and Wildlife (WDFW) to conduct nearshore surveillance of the coastal pelagic species (CPS) assemblage off Washington and Oregon. The PFMC previously approved this request in April 2019.

1. Applicants must submit a completed application in writing that includes, but is not limited to, the following information:

a. *Date of application*: October 17, 2019

First submitted October 19, 2017 and tentatively approved by the SSC November 2017 for PFMC review in April 2018, and re-submitted March 16th, 2019 with updates; approved April 2019.

b. *Applicant's names, mailing addresses, and telephone numbers*.

West Coast Pelagic Conservation Group.
Mailing Address: PO Box 1104, Westport WA 98595-1104
Phones: 360-619-2019 or 360-310-0662

c. *A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP*.

The purpose of the project is to provide acoustic and biological/composition data of coastal pelagic species (CPS) inshore of the proposed 2020 NOAA/SWFSC acoustic-trawl (ATM) survey to address the lack of survey coverage of nearshore areas where CPS biomass can concentrate. There are two stages for the proposed project in 2020. The first stage advances the proof-of-concept work undertaken in 2017 and 2019 in conjunction with the NOAA/SWFSC and the Washington Department of Fish and Wildlife (WDFW). The second stage to be conducted with the WDFW expands the proof-of-concept, adding new work to address sampling methodology concerns raised in reviews of the ATM survey.

During the first stage, surveying and sampling by an industry vessel, the F/V *Lisa Marie*, will be done concurrently with the NOAA/SWFSC survey from the Canada/US border to the Oregon/California border to overlap with and extend the nearshore transect of the NOAA vessel. The *Lisa Marie* will be equipped with a calibrated Simrad EK-60 downsounder that will acoustically sample in order to make relative comparisons with the offshore areas surveyed by the NOAA vessel. In addition, the *Lisa Marie* will use seine gear to conduct daytime sampling of acoustically identified CPS schools to evaluate species composition and collect biological data.

The second stage will be coordinated with the WDFW, and be conducted independent of and subsequent to the NOAA/SWFSC survey. The *Lisa Marie* will fish along Washington transects to test different fishing (e.g., set timing – day versus night), and sampling (e.g., species composition sample size) methodologies to improve species and biological characterization of acoustically surveyed schools.

During the project, the captain of the *Lisa Marie* will maintain a logbook provided by the WDFW to document set location, estimate school size, and tonnage wrapped. WDFW biologist(s) will assist with acoustic data collection (Stage 1), and direct and conduct sampling onboard. Fish will be dip-netted from wrapped schools, quantified (weighed or counted), and identified to species. Samples of 50 fish per CPS species will be collected from each set for biological sampling. If necessary, some fish samples may be frozen and retained for additional analyses to be performed by NOAA. Wrapped schools will be released alive, and no fish will be harvested or retained for commercial purposes.

d. Valid justification explaining why issuance of an EFP is warranted.

A long-standing concern identified by CPS stock assessment reviews is associated with the spatial and temporal coverage of the NOAA/SWFSC survey. This project seeks to close the gap in our comprehension of CPS biomass and distribution by enhancing the NOAA ATM survey methodology through surveillance of the CPS in nearshore, and other adjacent areas where the NOAA survey cannot sample or survey.

The ATM survey provides the only index used for informing abundance and distribution of CPS in stock assessments. Accurate stock assessments are indispensable for the short and long-term success of the fishing industry. The ATM survey employs the latest technologies, but has limitations. Due to safety concerns, the NOAA research vessels do not survey in waters less than 20-50 meters, however, CPS distribution does concentrate into waters of this depth. This is a point of concern identified by the fishing community, and in peer reviews of both the ATM survey and Pacific sardine stock assessments. Also, there is a large degree of temporal and spatial difference between detection and sampling: species sampling is limited to surface-trawl gear deployed at night, while acoustic surveying is conducted during the day. Often the surface-trawls capture very few or no fish. For years assessment reviewers have highlighted the need for larger sample sizes in closer proximity to acoustic backscatter.

The EFP may be needed because the project requires setting on CPS schools, including Pacific sardine, and the primary directed Pacific sardine fishery is closed.

e. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

This experimental fishing/surveillance approach could be applied to other species of fish that inhabit nearshore areas in any U.S. or Canadian waters. The techniques could be applied anywhere that additional species composition sampling would benefit fisheries survey work. Nearshore biological sampling and acoustic work may be useful to inform future stock assessment on CPS, or other species abundance, behavior, and species composition in nearshore waters where trawl sampling and deep draft vessel surveillance is not an option.

f. A statement whether the applicant intends to continue the EFP activities for more than one year. NMFS issues EFPs for only one year at a time. However, if an EFP proposal has a multi-year focus, this information should be included in the proposal.

Yes, the applicants intend to continue more than one year contingent on funding.

g. Number of vessels and processors covered under the EFP, as well as vessel names, skipper names, and vessel ID and permit numbers.

One vessel: F/V *Lisa Marie*, Coast Guard #: 1038717; Captain: Ricky Blair, Owner: Andy Blair.

No processors will be involved in the handling of the samples unless it is to transfer samples to a location designated, and as directed, by the NOAA/SWFSC or the WDFW. There will be no commercial purchase of fish in this project.

h. A description of the species to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment; this description should include estimates of harvest impacts to non-target species.

Species wrapped and sampled may include Pacific sardine, northern anchovy, jack mackerel, Pacific mackerel, and other CPS, and non-target species including smelts, flatfishes, cods, rockfishes and salmon.

The project anticipates needing to retain for species composition estimates and biological sampling a maximum of 5 metric tons of Pacific sardine and 5 metric tons for all other CPS and non-target species, combined. All fish wrapped but not dip netted for sampling will be released from the seine net immediately upon completion of the dip netting.

i. A reasonable justification for the amount of EFP fish to be harvested. For statistical purposes, this could include a power analysis or other means to estimate a reasonable amount or number of fish. Any other justification that supports the amount of fish proposed for EFP activities should also be included.

The amount of fish requested under the EFP is intended to allow statistically valid sample sizes of encountered CPS to be collected per set for species composition evaluation and the collection of biological data. Data are needed to support power analyses.

The target sample size for biological sampling will be 50 fish per species per set. Following protocols provided for 2019, species composition sampling will entail taking three dip netted scoops (5 to a maximum of 25 kg) per set during the first stage. During the second stage of the project, the number of scoops collected will be modified to evaluate the optimum number required to characterize species composition.

The number of sets accomplished over both stages of the project will be determined by the number of CPS schools observed, sampling protocols, and logistical constraints.

j. A description of a mechanism, such as at-sea or dockside fishery monitoring, to ensure that the harvest or impact limits for targeted and incidental species are not exceeded, and are accurately accounted for and reported.

For 2020, as in 2019, WDFW biologist(s) will be onboard the *Lisa Marie* to maintain acoustic records, complete fishing logs, monitor sets, document fish retained, and conduct species composition and biological sampling. NOAA staff may also be onboard the first stage.

k. A description of the proposed data collection methods, including procedures to ensure and evaluate data quality during the experiment, and data analysis methodology and timeline of stages through completion.

See Attachment 1 (SWFSC-Industry Collaborative, Summer 2019, Nearshore WA-OR Survey) and Attachment 2 (Industry-WDFW Collaborative, Summer 2020, Nearshore WA-OR Survey) for data collection methods and procedures to evaluate data quality. Preliminary set and species encountered data collected by the *Lisa Marie* in 2019 are presented in Attachment 3.

All data will be provided to the NOAA/SWFSC for use at their discretion.

l. A description of how vessels will be chosen to participate in the EFP.

The *Lisa Marie* was chosen based on dialogue with the NOAA survey team about the type and size of vessel, availability, and a history of conducting research. The vessel selection was supported by members of West Coast Pelagic Conservation Group.

m. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will occur, and the type, size, and amount of gear to be used.

The *Lisa Marie* will survey the nearshore waters of Washington and Oregon during the first stage at a time scheduled in conjunction with the NOAA survey activities, most likely in a 14-day window between mid-June and August. Exact time and dates will be dependent on the NOAA survey vessel schedule.

The second two-week stage of the project will commence some period of time (beginning no later than September) after the conclusion of the first stage. The length of each stage is approximate.

The *Lisa Marie* will deploy a seine net that is 230 fathoms in length, 2800 meshes deep, with a mesh size of 11/16.

n. The signature of the applicant.

Michael M. Okoniewski
Board Member
West Coast Pelagic Conservation Group

Attachment 1

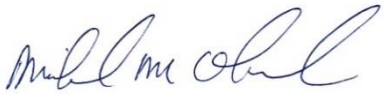
SWFSC-Industry Collaborative Nearshore Survey

Platform: Fishing Vessel *Lisa Marie*

Project Title: SWFSC-Industry Collaborative, Summer 2019, Nearshore WA-OR Survey

Project Dates: 14 days during ~18 June-2 July 2019

David A. Demer, Ph.D.
Senior Scientist, Program Leader
Advanced Survey Technologies Group
SWFSC

Approved by:  Dated: 10/13/2019

Mike Okoniewski
Senior Advisor
Pacific Seafood

Approved by: _____ Dated: _____
Dale Sweetnam
Acting Director
Fisheries Resources Division
SWFSC

Approved by: _____ Dated: _____
Kristen Koch
Science and Research Director
SWFSC

Overview

During 13 June-9 September 2019, SWFSC FRD will survey the distributions and abundances of coastal pelagic fish species (CPS), their prey, and their biotic and abiotic environments in the California Current between the northern extent of Vancouver Island, Canada, and San Diego, California (RL-19-04) from NOAA FSV *Reuben Lasker.* In summer 2018, *Lasker* only surveyed in water depths greater than ~ 20 to 30 m, and therefore potentially under-sampled any CPS aggregations in the shallower, nearshore area. The aim of this collaborative research is to quantify this potential sampling bias by using an industry fishing vessel, *Lisa Marie*, to extend the sampling closer to shore.

The principal components of the nearshore sampling include: AST's Simrad EK60 General Purpose Transceiver (GPT) connected to *Lisa Marie*'s Simrad 38 kHz transducer (ES38-B); *Lisa Marie*'s Furuno 250 sonar display; and Washington Department of Fish and Wildlife (WDFW) processing of *Lisa Marie*'s purse seine catches.

During 27-29 May 2019, an AST member (Josiah Renfree) will install, test, and calibrate the EK60 recording system (principally a WBT, GPS, and control and logging laptop PC). Additionally, crosstalk between the vessel's sonar and the echosounder will be evaluated at sea. At this time, members of WDFW (TBD) and *Lisa Marie*'s captain, Ricky Blair, will be trained on the echosounder data collection protocol.

When the *Lasker* is sampling off Washington and Oregon (estimated 18 June to 2 July 2019), one industry observer, Greg Shaughnessy, will embark *Lasker* from shore or *Lisa Marie*, using *Lasker*'s launch, and stay aboard for ~5 days. Meanwhile, *Lisa Marie* will conduct echosounder (Simrad EK60) sampling along transects between the 5 and 60-m isobaths, spaced 5 nmi (see **Fig. 1** and **Table 1**). *Lisa Marie* will also use purse-seine sampling in the nearshore area to obtain information about the proportions of species in the area, their lengths, weights, and ages (estimated from otoliths). During this period, one or two WDFW biologists (TBD) will be aboard *Lisa Marie* to log EK60 data, process the catch, and maintain a log of all sampling activities.

To ensure that the samplings from *Lasker* and *Lisa Marie* are contemporaneous (± ~3 days), the acousticians aboard *Lasker*, David Demer and Josiah Renfree, will coordinate with Captain Ricky Blair aboard *Lisa Marie*.

Methods

Acoustic Sampling

The 14-day survey will be conducted according to the following time budgets: transits at 9 kn (~2 d), transects at ~6 kn (~8.5 d), purse seine (~2.5 d), and contingency (1 d). *Lisa Marie* is expected to depart Westport on 18 June and begin sampling the nearshore area off Washington at Cape Flattery (**Fig. 1**). She will sample the 78 east-west transects (~5 nmi-long with ~ 5 nmi spacing) at ~6 kts, during ~ 5 hrs daytime (sunrise to sunset), progressing at a rate of ~7 transects per day. Acoustic sampling of each east-west transect is expected to occur on a straight line between the inshore and offshore waypoints (**Table 1**). Deviations from these transect lines should be minimized. The nearshore transects continue to the Oregon-California border.

Purse Seine Sampling

When putative CPS schools are observed in the echogram along a transect, *Lisa Marie* will finish surveying the transect, then use a purse seine net to sample the sizes and species composition of the CPS in the area. *Lisa Marie* will fish, on average, three (3) times per day (excluding the first

and last day), each time for ~60 minutes. This strategy should provide data from ~33 sets over the course of the study. The seine net will be set only during daytime.

To avoid or mitigate interactions with protected species, the net will not be set around pinnipeds but may be set if only a few are visible in the area. Pinnipeds are often attracted to the net and easily jump into and out of the net; the net will not be opened if only pinnipeds enter it. If any dolphins or porpoises are seen within 500 m of the vessel, the move-on rule is applied. If killer whales are seen at any distance, the move-on rule is applied. If any cetaceans are seen within the net it is opened immediately.

The catch-processing protocol follows:

- For every set, collect three (3) dip net samples, separated as much as possible in the purse-seine.
- For each dip net sample, sort the sardine, anchovy, Pacific mackerel, jack mackerel and herring and record the number and combined weight of each species.
- Combine the dip net catches, randomly sample as many as 50 specimens of each species, and record the number and combined weight of each species.
- For each specimen of each species in the random sample:
    - Record standard length for sardine and anchovy, and fork length for mackerels and herring, to the nearest millimeter.
    - Record weight to the nearest gram.
- For up to 25 fish randomly sampled from each species randomly sampled above:
    - Record macroscopic maturity stage.
    - Extract otoliths.
    - Collect and preserve female gonads.

Coordination and Data Exchange

Conditions permitting, *Lisa Marie* and *Lasker* will communicate daily to exchange information and maintain temporal and spatial coherence of the samples. If daily encounters are not possible, or if a large temporal mismatch between *Lisa Marie* and *Lasker* occurs, *Lisa Marie* will continue the sampling protocol independently of *Lasker*, at a rate of ~7 transects per day for the remaining available time.

At the conclusion of their ~5 d observing period, the industry observer (GS) will disembark *Lasker*, aboard *Lasker*'s launch, to *Lisa Marie* or shore. At the conclusion of the nearshore survey aboard *Lisa Marie*, WDFW biologists disembark *Lisa Marie* at Westport, WA. WDFW will forward collected data to the SWFSC.

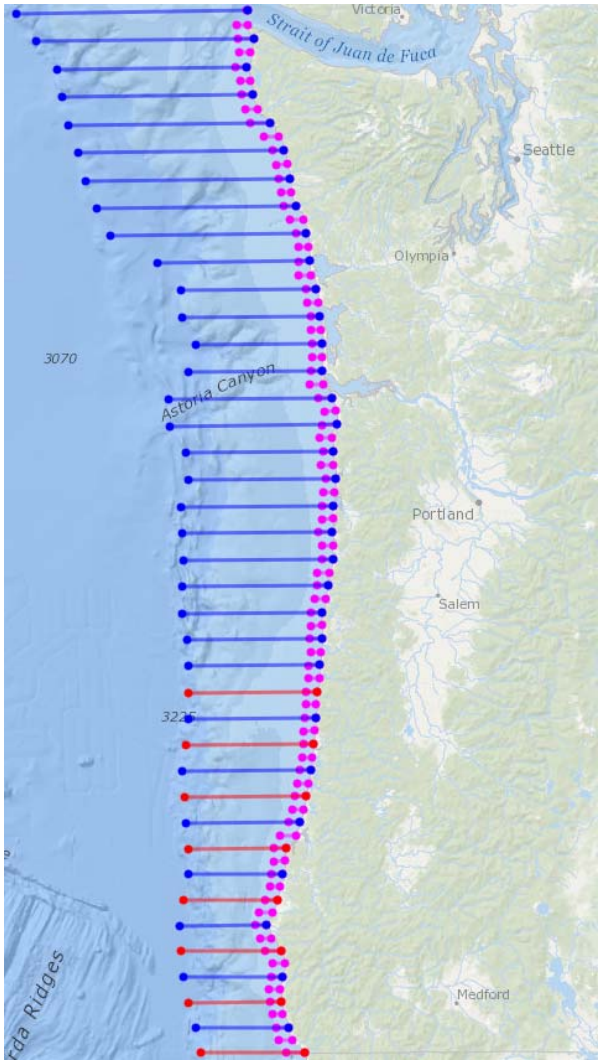


Figure 1. *Lasker*'s compulsory (red) and adaptive transect lines (blue) overlaid on *Lisa Marie's* nearshore lines (pink). Both vessels will run the transects to the east as close to shore as safely navigable.

Table 1. Waypoints for *Lisa Marie*'s proposed track lines in **Fig. 1**. Note, the inshore waypoints are nominal, and *Lisa Marie* will continue transects as close to shore as safely navigable. The 14-day survey includes transits at 9 kn (2 d), transects at ~6 kn (8.5 d), purse seine 3 hr/d (2.5 d), and contingency (1 d).

Transect	Waypoint	Latitude	Longitude
133	133.1	41.916919	-124.220489
133	133.2	41.916898	-124.326015
134	134.1	41.999377	-124.236434
134	134.2	41.999366	-124.343377
135	135.1	42.08315	-124.338048
135	135.2	42.083095	-124.444276
136	136.1	42.165979	-124.370768
136	136.2	42.166026	-124.476914
137	137.1	42.249497	-124.421778
137	137.2	42.249471	-124.512449
138	138.1	42.332575	-124.433939
138	138.2	42.332609	-124.532724
139	139.1	42.415889	-124.434643
139	139.2	42.415899	-124.54299
140	140.1	42.499119	-124.42753
140	140.2	42.499083	-124.533958
141	141.1	42.58198	-124.399027
141	141.2	42.582024	-124.505496
142	142.1	42.66028	-124.42124
142	142.2	42.660328	-124.528937
143	143.1	42.748805	-124.518577
143	143.2	42.748781	-124.626226
144	144.1	42.831547	-124.596058
144	144.2	42.831498	-124.702541
145	145.1	42.915373	-124.510847
145	145.2	42.91542	-124.618397
146	146.1	42.99913	-124.470872
146	146.2	42.999166	-124.579375
147	147.1	43.082262	-124.445015
147	147.2	43.082297	-124.552671
148	148.1	43.166506	-124.417689
148	148.2	43.166553	-124.525612
149	149.1	43.249422	-124.398061
149	149.2	43.249484	-124.505734
150	150.1	43.333228	-124.387747
150	150.2	43.333168	-124.498104
151	151.1	43.415778	-124.305782
151	151.2	43.415817	-124.414067
152	152.1	43.499564	-124.268974
152	152.2	43.499516	-124.377323
153	153.1	43.583392	-124.234711

Transect	Waypoint	Latitude	Longitude
153	153.2	43.583417	-124.342496
154	154.1	43.669037	-124.224033
154	154.2	43.669066	-124.332709
155	155.1	43.747053	-124.187247
155	155.2	43.747036	-124.295908
156	156.1	43.833273	-124.173311
156	156.2	43.833326	-124.282811
157	157.1	43.916793	-124.158235
157	157.2	43.916772	-124.267877
158	158.1	44.000566	-124.144986
158	158.2	44.000566	-124.254716
159	159.1	44.083775	-124.134787
159	159.2	44.083812	-124.243922
160	160.1	44.16694	-124.12506
160	160.2	44.166892	-124.234337
161	161.1	44.259583	-124.117071
161	161.2	44.25957	-124.226482
162	162.1	44.333194	-124.114482
162	162.2	44.333143	-124.223487
163	163.1	44.416714	-124.098188
163	163.2	44.416757	-124.209487
164	164.1	44.500115	-124.097378
164	164.2	44.500115	-124.207492
165	165.1	44.583471	-124.082201
165	165.2	44.583476	-124.192193
166	166.1	44.667054	-124.066427
166	166.2	44.666875	-124.177472
167	167.1	44.749985	-124.086867
167	167.2	44.749926	-124.197825
168	168.1	44.834305	-124.074905
168	168.2	44.834305	-124.164313
169	169.1	44.917557	-124.03452
169	169.2	44.9176	-124.145227
170	170.1	45.000372	-124.019266
170	170.2	45.000372	-124.129974
171	171.1	45.083825	-124.016715
171	171.2	45.083825	-124.129266
172	172.1	45.167873	-123.982336
172	172.2	45.167837	-124.093783
173	173.1	45.250614	-123.977351
173	173.2	45.250551	-124.08865
174	174.1	45.325872	-123.984183
174	174.2	45.325872	-124.096075
175	175.1	45.417799	-123.973325
175	175.2	45.417775	-124.085194
176	176.1	45.506645	-123.970466

Transect	Waypoint	Latitude	Longitude
176	176.2	45.506707	-124.081234
177	177.1	45.584655	-123.96103
177	177.2	45.58461	-124.073003
178	178.1	45.667475	-123.94921
178	178.2	45.667534	-124.062055
179	179.1	45.750514	-123.982178
179	179.2	45.750515	-124.096041
180	180.1	45.833506	-123.971839
180	180.2	45.833543	-124.08501
181	181.1	45.917365	-123.99779
181	181.2	45.91736	-124.110407
182	182.1	46.000483	-123.94402
182	182.2	46.000483	-124.057429
183	183.1	46.084051	-123.947363
183	183.2	46.083991	-124.060934
184	184.1	46.167166	-123.985683
184	184.2	46.167166	-124.100293
185	185.1	46.258389	-124.093254
185	185.2	46.258404	-124.223847
186	186.1	46.332335	-124.079674
186	186.2	46.332208	-124.194686
187	187.1	46.416549	-124.067517
187	187.2	46.416549	-124.182136
188	188.1	46.500377	-124.065646
188	188.2	46.500377	-124.161239
189	189.1	46.583752	-124.074982
189	189.2	46.583809	-124.189096
190	190.1	46.666356	-124.10257
190	190.2	46.666356	-124.218017
191	191.1	46.749398	-124.155569
191	191.2	46.749382	-124.270357
192	192.1	46.833369	-124.119075
192	192.2	46.83334	-124.234668
193	193.1	46.936044	-124.184965
193	193.2	46.936046	-124.30002
194	194.1	46.998202	-124.183323
194	194.2	46.99813	-124.298942
195	195.1	47.082741	-124.190476
195	195.2	47.082795	-124.307213
196	196.1	47.163497	-124.207148
196	196.2	47.163259	-124.323196
197	197.1	47.2486	-124.238293
197	197.2	47.2486	-124.354904
198	198.1	47.330837	-124.301104
198	198.2	47.330809	-124.418552
199	199.1	47.389013	-124.332964

Transect	Waypoint	Latitude	Longitude
199	199.2	47.388993	-124.452709
200	200.1	47.496698	-124.356678
200	200.2	47.496655	-124.472449
201	201.1	47.581017	-124.375669
201	201.2	47.581059	-124.492588
202	202.1	47.648866	-124.400045
202	202.2	47.648843	-124.516621
203	203.1	47.736606	-124.500679
203	203.2	47.736633	-124.618851
204	204.1	47.828089	-124.585412
204	204.2	47.828137	-124.705558
205	205.1	47.912635	-124.683333
205	205.2	47.912687	-124.800551
206	206.1	47.993888	-124.736789
206	206.2	47.993917	-124.854284
207	207.1	48.076946	-124.723779
207	207.2	48.076981	-124.841542
208	208.1	48.159861	-124.760275
208	208.2	48.159825	-124.877909
209	209.1	48.246786	-124.712865
209	209.2	48.246854	-124.83062
210	210.1	48.327238	-124.683127
210	210.2	48.327181	-124.802639
211	211.1	48.409282	-124.749244
211	211.2	48.409329	-124.868431

Appendix A. Echosounder Equipment

EK60 System

The EK60 system is comprised of a 38-kHz GPT, a split-beam transducer, AC or DC power, a connection to the ship's ground, synchronization with other sounders and sonars, and an Ethernet connection to a laptop PC running Simrad ER60 control and data logging software. In this installation, the temperature sensor, event input, motion sensor, new line, and remote on/off inputs (see **Fig. A1**) will not be used.

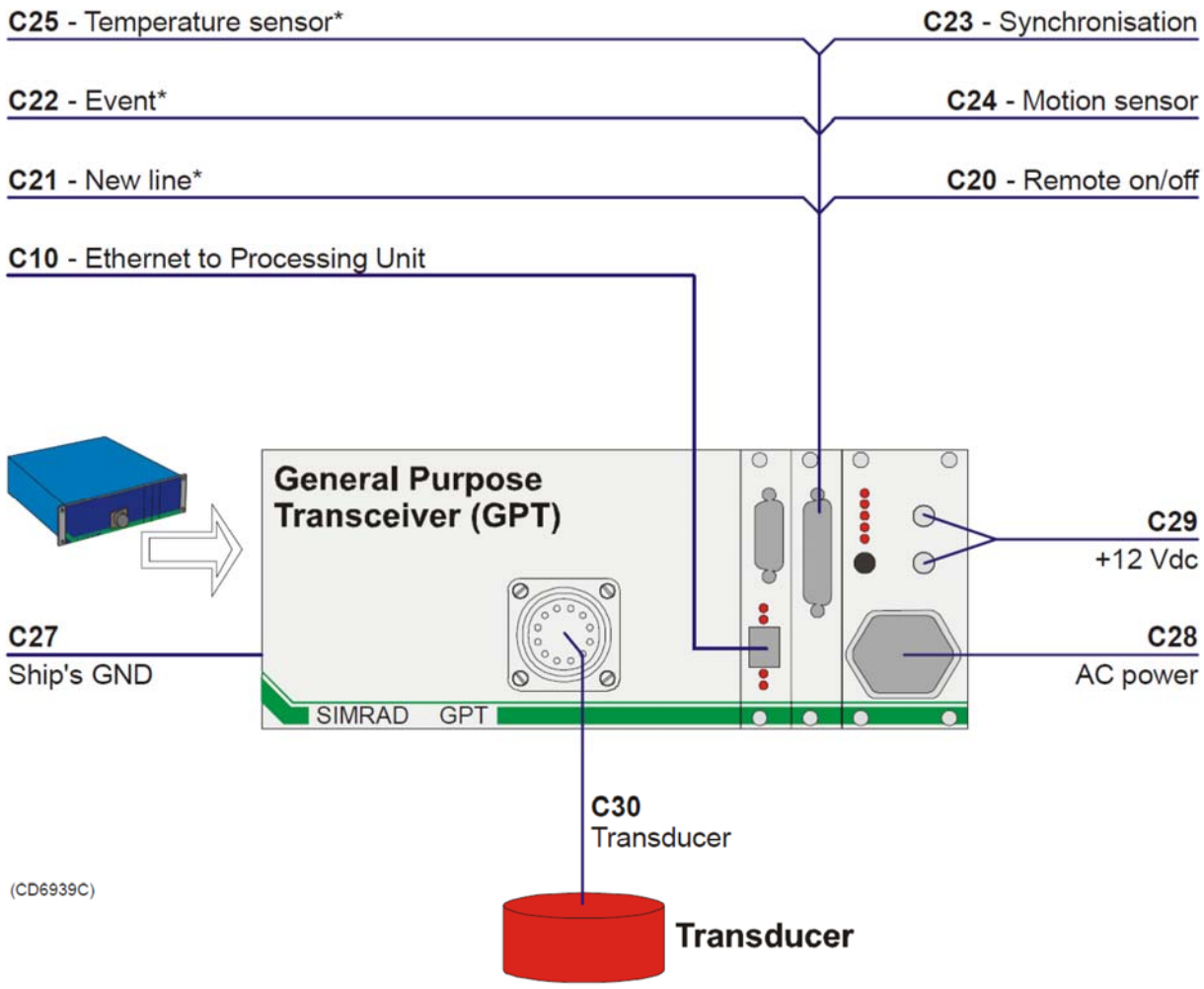


Figure A1. Diagram of connections to the Simrad General Purpose Transceiver (GPT), notably including: TrigOut from the auxiliary port (C23), AC power (C28), grounding (C27), ES38-B transducer (C30), and Ethernet to a laptop running Simrad ER60 software (C10).

Transducer
The ES38-B transducer, mounted in the hull of *Lisa Marie*, is connected, via a terminal strip in a junction box on the bridge, to the GPT using an 11-pin Amphenol connector (**Fig. A2**).

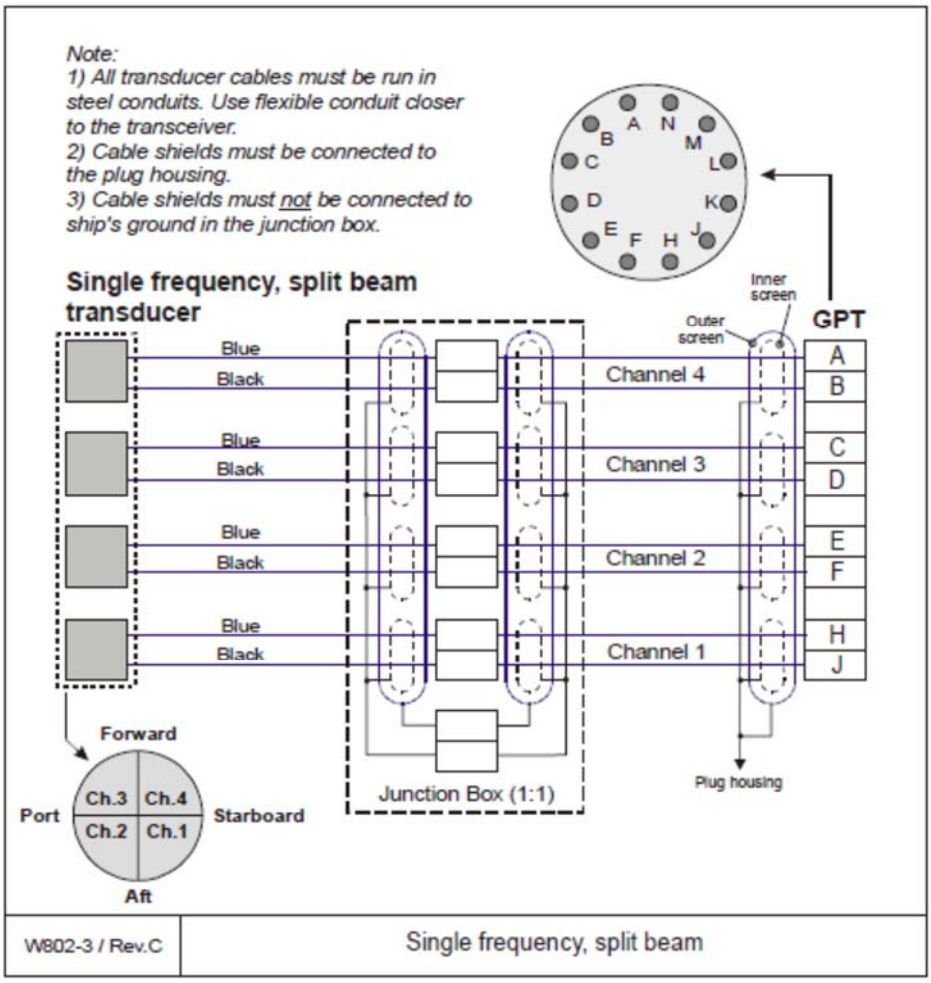


Figure A2. Wiring diagram for the Amphenol connector used to connect the ES38-B transducer to the EK60 GPT. Note, the polarity is important for split-beam function; and the cable shields must not be connected to the ship's ground in the junction box.

Power
The GPT may be powered by either 110 AC or 12 VDC/7A. To reduce noise in the echosounder data, use a power strip with line filter.

Ground
The GPT chassis must be connected to the ship's ground using a cable that is as short as possible.

ER60 Computer
The EK60 will be controlled, and its data will be logged, using a laptop PC (ASUS) running Simrad EK80 software. Data will be backed-up to USB hard disk drives (HDDs). The laptop will be connected directly to the EK60 GPT via an ethernet cable; and to a handheld GPS receiver via a USB-to-serial adapter.

Ethernet

The Ethernet cable which connects the GPT and the laptop may be direct, using a “crossover cable”, or via an Ethernet switch, using two “straight through” Ethernet cables (**Fig. A2**).

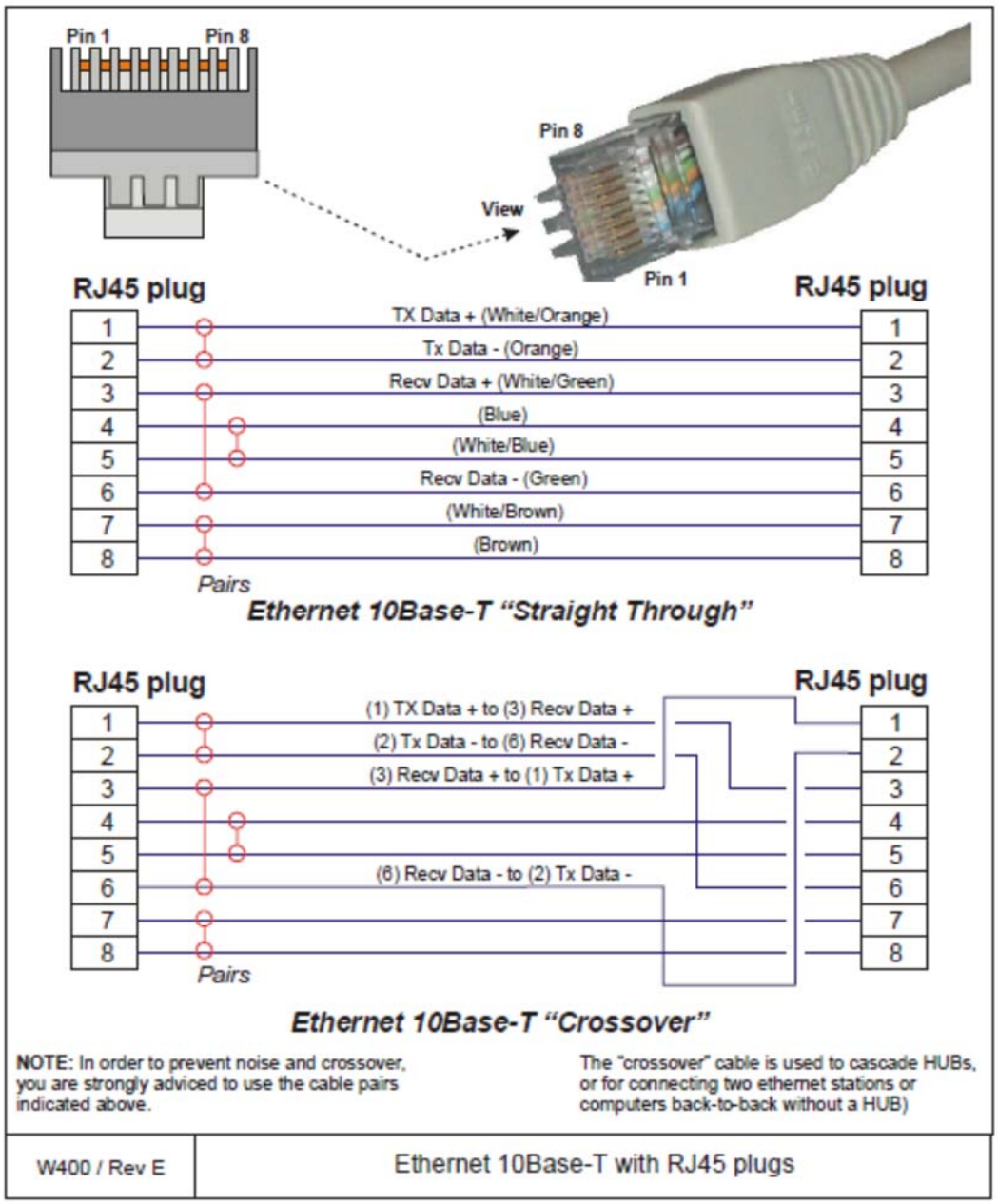


Figure A2. The GPT and laptop are connected by Ethernet, either directly using a “crossover” cable, or via a switch using “straight through” cables.

GPS Data

NMEA 0183 data from a GPS receiver must be input to the laptop via a USB-serial adapter. The communication parameters are 4800 bps, 8 data bits, no parity, and one stop bit. The GPS's serial output signal (Tx, pin 3) and ground (pin 5) wires must be connected to the laptop's serial input signal (Rx, pin 2) and ground (pin 5) wires using a maximum cable length of 10 m (**Fig. A3**).

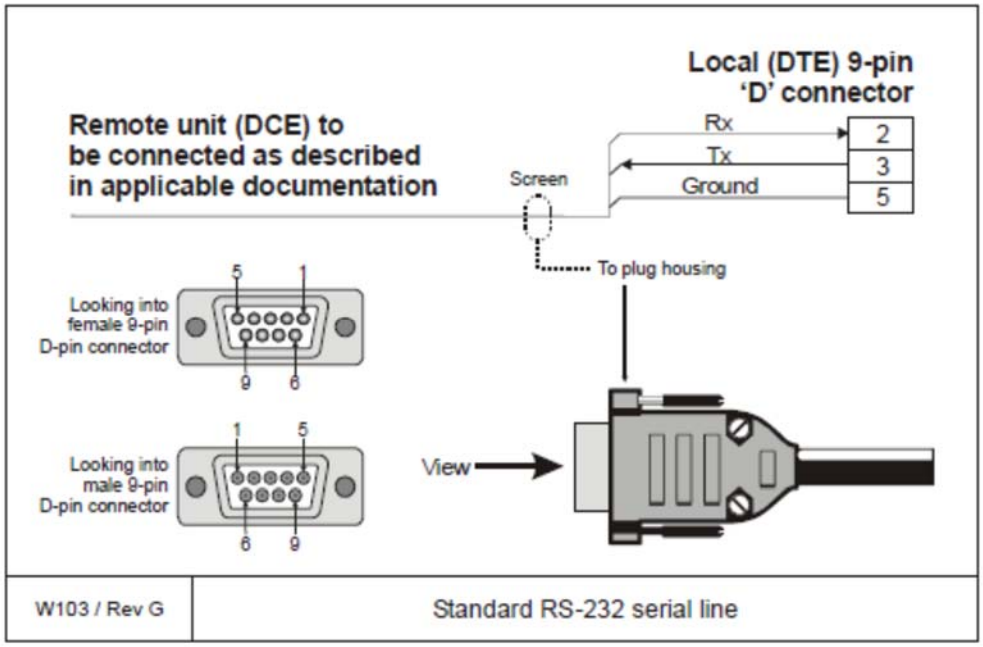


Figure A3. The GPS's transmit signal (NEMA 0183 format) is input to the laptop PC on pins 3 (Tx) and 5 (ground) of a DB-9 connector.

A GPS receiver will be installed in the starboard-aft corner of the wheelhouse (**Fig. A4**), with an antenna running outside and on top of the cabin. The EK60 GPT and controlling and data-logging laptop will be located on the bridge of *Lisa Marie* (**Figs. A4-A7**).

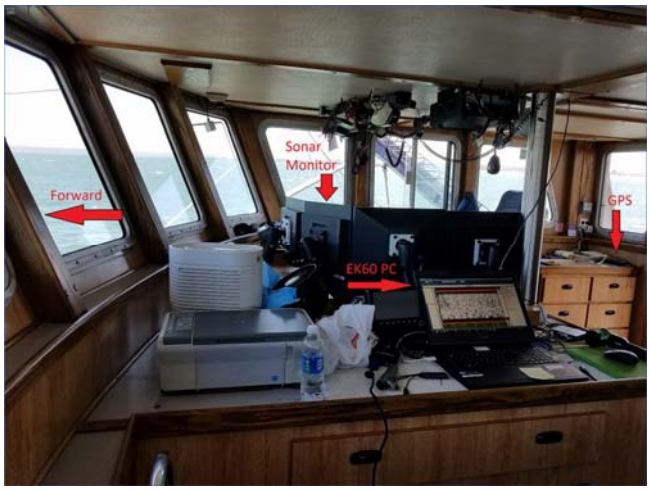


Figure A4. Table on the bridge of *Lisa Marie* (top) where the EK60 controlling and logging laptop will be located. The table is located to the port side of the helm station, behind the array of instrumentation and monitors.

Figure A5. The EK60 GPT and Furuno CH-250 sonar transceiver will be installed under the main console in the wheelhouse.

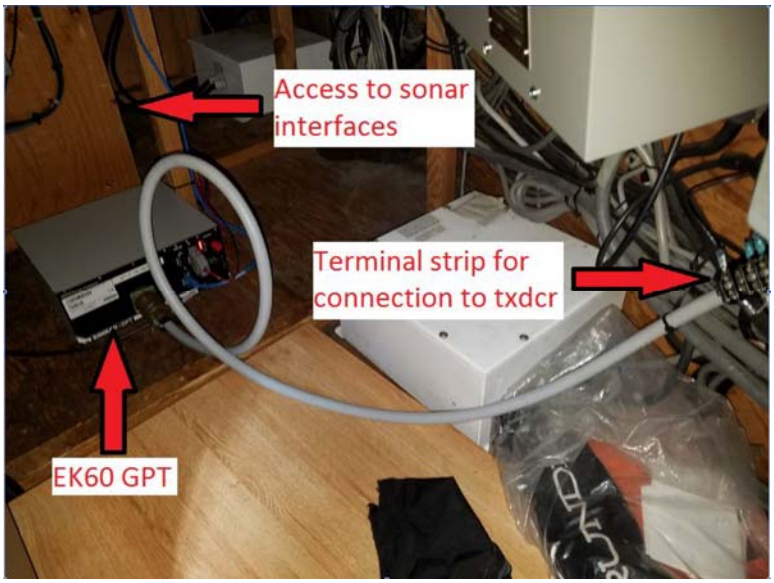


Figure A6. The EK60 GPT will be attached to the deck with Velcro.

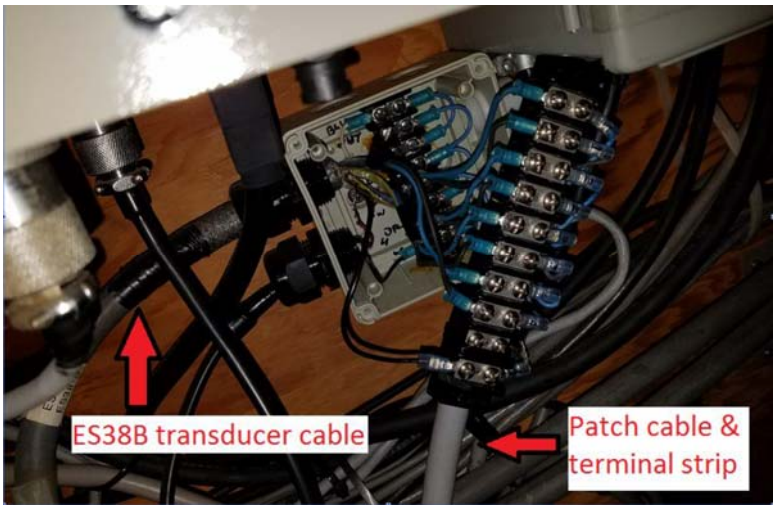


Figure A7. The transducer patch cable will connect to the transducer through a terminal strip in a junction box.

EK60 Calibration

The EK60 system will be configured for operation with a transmit power of 2000 W, pulse length of 1024 μs, ping rate of "Maximum" (~3 Hz), and logging range of 200 m.

Prior to the survey, the EK60 system must be calibrated relative to a sphere made from tungsten carbide with 6% cobalt binder material, suspended directly beneath the transducer, at a range of more than 7 m, using two or three lengths of fishing line (**Fig. A8**). The lines may be controlled manually. This procedure requires two people on deck and one on the bridge observing the ER60 display.

Prior to the calibration, the transducer face must be cleaned of all biofouling, and the local water temperature and salinity must be measured to estimate sound speed and absorption coefficients.

The EK60 system aboard *Lisa Marie* was calibrated successfully in June 22, 2017 (**Table A1**).

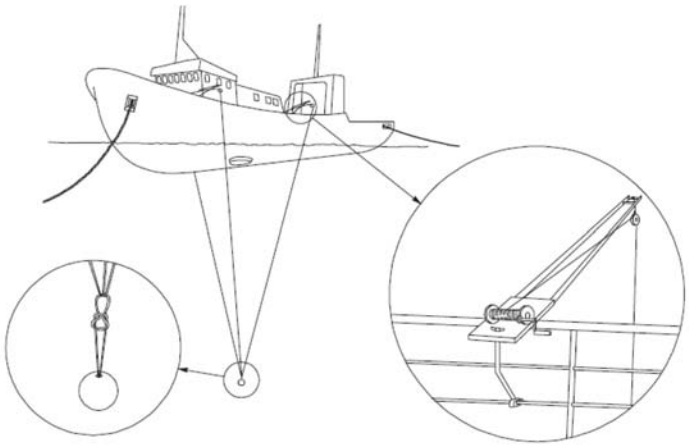


Figure A8. The EK60 system is calibrated by suspending a metal sphere directly beneath the transducer at a range of more than 20 feet. The sphere is tethered using two or three monofilament lines. It is positioned by manually adjusting the line positions and lengths. Note: prior to the calibration, the transducer face must be cleaned of all biofouling.

Table A1. Results from the June 22, 2017 calibration of the EK60 system aboard *Lisa Marie*, for comparison to the 2019 pre-survey calibration. Water temperature = 11.8 C, salinity = 31.3 ppt, and sound speed = 1491.7 m/s.

	ER60	EK80
Gain	22.22	22.07
Alongship Beamwidth	7.02	7.46
Athwartship Beamwidth	6.77	7.14
Alongship Offset Angle	-0.01	0.00
Athwartship Offset Angle	-0.02	-0.04
Sa Correction	-0.38	-0.40
RMS	0.30	0.14

Sonar System

The Furuno 250 sonar aboard *Lisa Marie* will be used to observe near-surface fish schools, to aid capture with the purse-seine net.

Noise in the EK60 data, originating from operation of the Furuno 250 sonar and ship's depth sounder, must be evaluated prior to the survey and mitigated. To evaluate crosstalk noise from the sonar and depth sounder, the EK60 GPT will be set in passive mode and noise measurements will be collected with the CH-250 turned on and then off, and then the depth sounder turned on and then off.

Note: Prior to the 2017 survey aboard *Lisa Marie*, tests indicated that both the sonar and the depth sounder caused significant noise in the EK60 signal (**Fig. A9**). If noise testing cannot be repeated prior to the summer 2019 nearshore survey, or if the crosstalk has not been mitigated since 2017, both the sonar and the depth sounder should remain off during the daytime E-W transects of the nearshore survey.

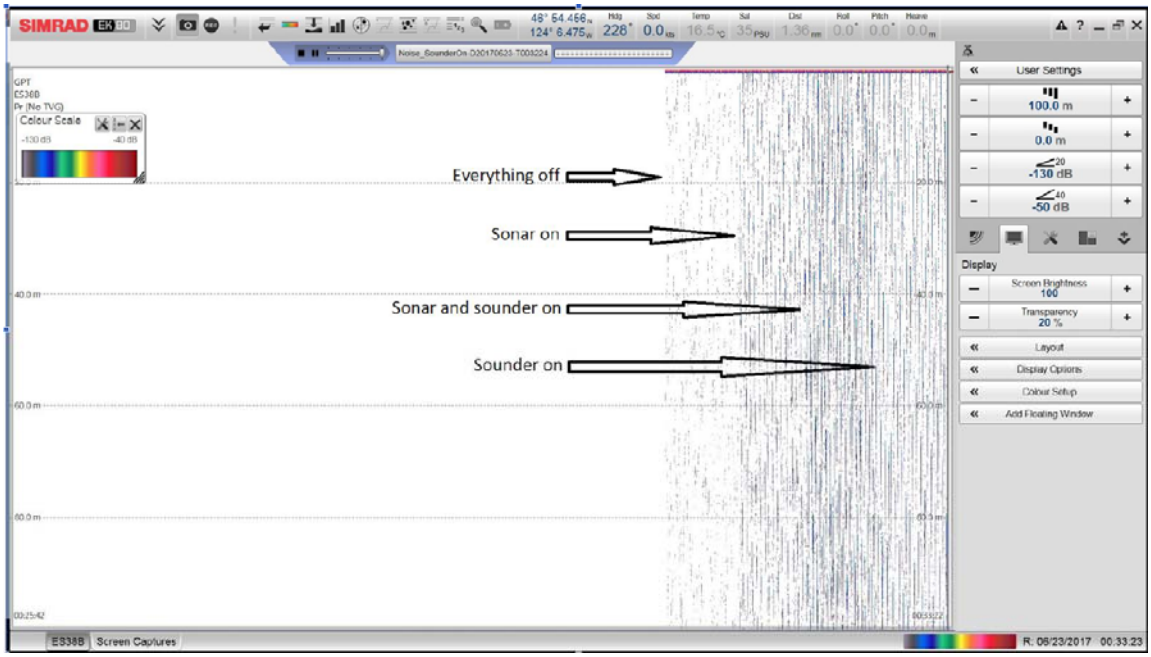


Figure A9. Results of noise testing prior to the summer 2017 nearshore survey aboard Lisa Marie, which show that both the sonar and echosounder cause significant crosstalk in the EK60 signal. Unless this crosstalk has been mitigated, the sonar and depth sounder should remain off during the daytime E-W transects.

Contact List

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Equipment List

Equipment / Supply	Quantity	Responsibility
EK60 GPT (with AC power cable)	1	AST
Line-conditioning power strip	2	AST
GPT ground cable	1	J&G Marine Supply
GPT 110V AC power source	1	J&G Marine Supply
ES38-B Transducer	1	F/V *Lisa Marie*
ES38-B Factory Calibration Sheet	1	J&G Marine Supply
Transducer cable and Amphenol connector (6')	1	AST
ER60 Laptop PC (and spare)	2	AST
USB-Serial adapter (and spare)	2	AST
2-TB USB HDDs (and spare)	2	AST
Handheld GPS receiver, antennae, PS (backup)	2	AST
Male DB-9 serial plug (and spare) for GPS input	2	AST
Male DB-25 serial plug (and spare) for auxiliary	2	AST

“Crossover” Ethernet cable (and spare)	2	AST
“Straight through” Ethernet cables (backup)	2	AST
Four-port Ethernet switch and PS (backup)	1	AST
Surge suppressor/line filter power strip (and spare)	2	AST
Extension cord (and spare)	2	AST
Furuno 250 sonar	1	F/V *Lisa Marie*
Synchronize *Lisa Marie*’s sounders and sonar from GPT Auxiliary	1	J&G Marine Supply
38.1-mm diameter WC (6% Co) sphere (and spare)	2	AST
Reel, ~20 lb test monofilament line	1	AST
Handheld VHF radios and charger	3	AST
YSI Pro2030 probe	1	AST

Attachment 2

West Coast Pelagic Conservation Group -WDFW Collaborative Nearshore Survey
Draft Project Agreement

Platform: Fishing Vessel *Lisa Marie*
Project Title: Industry-WDFW Collaborative, Summer 2020, Nearshore WA-OR Survey
Project Dates: July – September 2020 (specific date dependent on conclusion of NOAA-SWFSC ATM Summer 2020 Survey)

Approved by: Dated: 10/13/2019
Mike Okoniewski
Senior Advisor
Pacific Seafood

Approved by: _____ Dated: _____
Tien-shui Tsou, Ph.D.
Senior Scientist, Program Leader
Marine Fish Science Program
WDFW

Approved by: _____ Dated: _____
Lorna Wargo, MSc.
Manager
Marine Fish Science Program
WDFW

Overview

During June-September 2020, the Washington Department of Fish and Wildlife (WFDW) and West Coast Pelagic Conservation Group (WCPCG; industry) will evaluate alternative strategies for validating species composition. The goal of this proof-of-concept project is to address the temporal and spatial difference between detection and sampling of CPS in the NOAA/SWFSC ATM survey: species sampling is limited to surface-trawl gear deployed at night, while acoustic surveying is conducted during the day. Often the surface-trawls capture very few or no fish. Fishermen's experience suggests that species composition varies significantly from day to night.

The F/V *Lisa Marie* will survey Washington nearshore waters for CPS one to two months after the initial NOAA-SWFSC survey. The anticipated length for this stage is 10 to 12 days (sea-time), including standby days for inclement weather.

Methods

The *Lisa Marie* will depart Westport and begin sampling of the nearshore area off Washington on established transects (from Stage 1) where fish are present. Transiting of each transect is expected to occur on a straight line between the inshore and offshore waypoints. The direction of travel, west to east and/or east to west, will be prescribed. Deviations from transect lines should be minimized.

When putative CPS schools are observed along a transect, the *Lisa Marie* will use a purse seine net to sample the sizes and species composition of the CPS. For day-night comparisons, the *Lisa Marie* will fish, on average, four (4) times per 24-hour period, each time for approximately60 minutes to be repeated five (5) days. This strategy should provide data from 20 sets over the course of the study. Additional days may be fished.

To avoid or mitigate interactions with protected species, the net will not be set around pinnipeds but may be set if only a few are visible in the area. If any dolphins or porpoises are seen within 500 m of the vessel, the move-on rule is applied. If killer whales are seen at any distance, the move-on rule is applied. If any cetaceans are seen within the net it is opened immediately.

The catch-processing protocol follows:

- For each school to be sampled, document location, and estimate school size and amount wrapped.
- For every set, collect up to 10 dip net samples, separated as much as possible in the purse-seine. If unable to collect 10 samples, a census should be conducted. Each scoop should be approximately 4.5 kg (or 10 pounds).
- For each dip net sample, sort the Pacific sardine, Northern anchovy, Pacific mackerel, jack mackerel, Pacific herring, and market squid and record the number, and combined weight of each species.
- Combine the dip net catches by species, randomly sample as many as 50 specimens of each species noted above, and record the number and total weight of each species.
- For each specimen of each species in the random sample:
    - Record standard length for sardine and anchovy, fork length for mackerels and herring, and mantle length for squid to the nearest millimeter.
    - Record weight to the nearest gram.
- For up to 25 fish randomly sampled from each species randomly sampled above:

    - Record macroscopic maturity stage.
    - Extract otoliths.
- For up to 25 fish of species not listed above and randomly selected from the combined dip net catches
    - Record length and weight for each specimen

Coordination and Data Exchange

The WDFW will coordinate and direct the daily sampling operations of the *Lisa Marie*. Data will be shared with the WCPCG and SWFSC.

Draft Summary of the 2019
West Coast Pelagic Conservation Group
Collaborative "Proof of Concept Project" for Nearshore Surveillance Acoustic Trawl Methodology Survey of North West Coastal Waters

This preliminary summary is intended to lead to fulfilling the reporting requirements of the exempted fishing permit (EFP-06/08-2019/2020) issued by NOAA/NMFS to the West Coast Pelagic Conservation Group (WCPCG) in 2019. The F/V *Lisa Marie* collected the data summarized here during the 2019 collaborative ATM CPS survey by the West Coast Pelagic Conservation Group, NOAA/Southwest Fisheries Science Center (SWFSC), and the Washington Department of Fish and Wildlife (WDFW). The work accomplished in 2019 was a continuation of a "proof of concept" study initiated by industry in 2017 to extend acoustic surveying and sampling of the CPS assemblage to the nearshore, to complement the offshore NOAA/SWFSC ATM survey. The EFP exempted the WCPCG from the prohibition on direct harvest of Pacific sardine consistent with project objectives.

The F/V *Lisa Marie* completed complimentary acoustic surveys of the nearshore distribution of CPS biomass off Washington and Oregon between June 17, 2019 and July 3, 2019. During this period, the *Lisa Marie* completed a total of 78 transects (27 transects off Washington and 51 off Oregon) as well as 30 purse seine sets. WDFW biologists were onboard for the duration of the project to collect species composition and biological data, as well as monitor the acoustic equipment and maintain a log of seining operations. All project data were submitted to NOAA/SWFSC. Age structures were given to the WDFW age readers for analysis and will be incorporated with the data once aged.

Transect lines were completed in an east to west direction beginning as near to shore as safely navigable following the planned transect lines in Table 1, starting with line number 211 at the Canada-Washington border and ending with line 134 at the Oregon-California border. Acoustic surveying began most mornings around 0630 PST (sunrise) and ended around 1900 PST (sunset). Sets were made after the completion of the transect and in proximity to the transect line if fish had been observed. Schools of fish observed while transiting to the next transect line were also set on. For all sets, the date, time, latitude, longitude, and general species composition were recorded. Set locations are provided in Table 2. Size of schools wrapped and estimate of tonnage released were not documented. Released fish were presumed alive. Of the 30 completed sets, one was aborted due to the net getting stuck in the skiff, and four were dumped due to appearing to be all jellyfish. Because of foul weather, no sets were made on June 30.

Three dip net samples of approximately 4.5 kg (10 pounds) each were collected per set from the seine for biological information and species composition. Table 3 presents all retained fish by date and set. For each species per set, a total weight in grams and total number were reported. For Pacific sardine, northern anchovy, Pacific mackerel, jack mackerel, and Pacific herring, a 50 fish sample was randomly collected from the total combined dip netted sample and weighed. Then

each of the 50 fish were sampled for length and weight, with 25 of the fish also being sampled for sex, macroscopic maturity, and age structures.

Table 1. Start and stop waypoints for *Lisa Marie* proposed track lines.

Transect	Waypoint	Latitude	Longitude
133	133.1	41.916919	-124.220489
133	133.2	41.916898	-124.326015
134	134.1	41.999377	-124.236434
134	134.2	41.999366	-124.343377
135	135.1	42.08315	-124.338048
135	135.2	42.083095	-124.444276
136	136.1	42.165979	-124.370768
136	136.2	42.166026	-124.476914
137	137.1	42.249497	-124.421778
137	137.2	42.249471	-124.512449
138	138.1	42.332575	-124.433939
138	138.2	42.332609	-124.532724
139	139.1	42.415889	-124.434643
139	139.2	42.415899	-124.54299
140	140.1	42.499119	-124.42753
140	140.2	42.499083	-124.533958
141	141.1	42.58198	-124.399027
141	141.2	42.582024	-124.505496
142	142.1	42.66028	-124.42124
142	142.2	42.660328	-124.528937
143	143.1	42.748805	-124.518577
143	143.2	42.748781	-124.626226
144	144.1	42.831547	-124.596058
144	144.2	42.831498	-124.702541
145	145.1	42.915373	-124.510847
145	145.2	42.91542	-124.618397
146	146.1	42.99913	-124.470872
146	146.2	42.999166	-124.579375
147	147.1	43.082262	-124.445015
147	147.2	43.082297	-124.552671
148	148.1	43.166506	-124.417689
148	148.2	43.166553	-124.525612
149	149.1	43.249422	-124.398061
149	149.2	43.249484	-124.505734
150	150.1	43.333228	-124.387747
150	150.2	43.333168	-124.498104
151	151.1	43.415778	-124.305782
151	151.2	43.415817	-124.414067

Transect	Waypoint	Latitude	Longitude
152	152.1	43.499564	-124.268974
152	152.2	43.499516	-124.377323
153	153.1	43.583392	-124.234711
153	153.2	43.583417	-124.342496
154	154.1	43.669037	-124.224033
154	154.2	43.669066	-124.332709
155	155.1	43.747053	-124.187247
155	155.2	43.747036	-124.295908
156	156.1	43.833273	-124.173311
156	156.2	43.833326	-124.282811
157	157.1	43.916793	-124.158235
157	157.2	43.916772	-124.267877
158	158.1	44.000566	-124.144986
158	158.2	44.000566	-124.254716
159	159.1	44.083775	-124.134787
159	159.2	44.083812	-124.243922
160	160.1	44.16694	-124.12506
160	160.2	44.166892	-124.234337
161	161.1	44.259583	-124.117071
161	161.2	44.25957	-124.226482
162	162.1	44.333194	-124.114482
162	162.2	44.333143	-124.223487
163	163.1	44.416714	-124.098188
163	163.2	44.416757	-124.209487
164	164.1	44.500115	-124.097378
164	164.2	44.500115	-124.207492
165	165.1	44.583471	-124.082201
165	165.2	44.583476	-124.192193
166	166.1	44.667054	-124.066427
166	166.2	44.666875	-124.177472
167	167.1	44.749985	-124.086867
167	167.2	44.749926	-124.197825
168	168.1	44.834305	-124.074905
168	168.2	44.834305	-124.164313
169	169.1	44.917557	-124.03452
169	169.2	44.9176	-124.145227
170	170.1	45.000372	-124.019266
170	170.2	45.000372	-124.129974
171	171.1	45.083825	-124.016715
171	171.2	45.083825	-124.129266
172	172.1	45.167873	-123.982336
172	172.2	45.167837	-124.093783
173	173.1	45.250614	-123.977351
173	173.2	45.250551	-124.08865
174	174.1	45.325872	-123.984183
174	174.2	45.325872	-124.096075

Transect	Waypoint	Latitude	Longitude
175	175.1	45.417799	-123.973325
175	175.2	45.417775	-124.085194
176	176.1	45.506645	-123.970466
176	176.2	45.506707	-124.081234
177	177.1	45.584655	-123.96103
177	177.2	45.58461	-124.073003
178	178.1	45.667475	-123.94921
178	178.2	45.667534	-124.062055
179	179.1	45.750514	-123.982178
179	179.2	45.750515	-124.096041
180	180.1	45.833506	-123.971839
180	180.2	45.833543	-124.08501
181	181.1	45.917365	-123.99779
181	181.2	45.91736	-124.110407
182	182.1	46.000483	-123.94402
182	182.2	46.000483	-124.057429
183	183.1	46.084051	-123.947363
183	183.2	46.083991	-124.060934
184	184.1	46.167166	-123.985683
184	184.2	46.167166	-124.100293
185	185.1	46.258389	-124.093254
185	185.2	46.258404	-124.223847
186	186.1	46.332335	-124.079674
186	186.2	46.332208	-124.194686
187	187.1	46.416549	-124.067517
187	187.2	46.416549	-124.182136
188	188.1	46.500377	-124.065646
188	188.2	46.500377	-124.161239
189	189.1	46.583752	-124.074982
189	189.2	46.583809	-124.189096
190	190.1	46.666356	-124.10257
190	190.2	46.666356	-124.218017
191	191.1	46.749398	-124.155569
191	191.2	46.749382	-124.270357
192	192.1	46.833369	-124.119075
192	192.2	46.83334	-124.234668
193	193.1	46.936044	-124.184965
193	193.2	46.936046	-124.30002
194	194.1	46.998202	-124.183323
194	194.2	46.99813	-124.298942
195	195.1	47.082741	-124.190476
195	195.2	47.082795	-124.307213
196	196.1	47.163497	-124.207148
196	196.2	47.163259	-124.323196
197	197.1	47.2486	-124.238293
197	197.2	47.2486	-124.354904

Transect	Waypoint	Latitude	Longitude
198	198.1	47.330837	-124.301104
198	198.2	47.330809	-124.418552
199	199.1	47.389013	-124.332964
199	199.2	47.388993	-124.452709
200	200.1	47.496698	-124.356678
200	200.2	47.496655	-124.472449
201	201.1	47.581017	-124.375669
201	201.2	47.581059	-124.492588
202	202.1	47.648866	-124.400045
202	202.2	47.648843	-124.516621
203	203.1	47.736606	-124.500679
203	203.2	47.736633	-124.618851
204	204.1	47.828089	-124.585412
204	204.2	47.828137	-124.705558
205	205.1	47.912635	-124.683333
205	205.2	47.912687	-124.800551
206	206.1	47.993888	-124.736789
206	206.2	47.993917	-124.854284
207	207.1	48.076946	-124.723779
207	207.2	48.076981	-124.841542
208	208.1	48.159861	-124.760275
208	208.2	48.159825	-124.877909
209	209.1	48.246786	-124.712865
209	209.2	48.246854	-124.83062
210	210.1	48.327238	-124.683127
210	210.2	48.327181	-124.802639
211	211.1	48.409282	-124.749244
211	211.2	48.409329	-124.868431

Table 2. Set date, time, location, and general species composition, *Lisa Marie*, 2019. Sets with an asterisk included a salmon either released from the net, or had small salmon collected in the dip net samples.

Date	Time	Set	Latitude	Longitude	Water Temperature (°F)	Comments
6/21	11:28	1	47° 49.2128	124°39.9539	51.97	tow aborted, net stuck in skiff
6/21	About 1500	2	47°44.3498	124°35.6315	52.3	mostly all herring
6/21	About 1730	3	47°38.2683	124°29.3498	51.77	mostly all whitebait smelt
6/22	10:02	1	47°23.3078	124°28.9926	53.23	almost all jellies with a few whitebait smelt
6/22	15:43	2*	47°9.9459	124°25.4624	54.37	krill and jellies, one chum in sample

Date	Time	Set	Latitude	Longitude	Water Temperature (°F)	Comments
6/22	17:00	3*	47°6.01	124°13.3499	54.43	herring and some whitebait smelt, 7 small chinook in sample
6/23	9:20	1*	46°58.1877	124°13.9114	53.13	whitebait smelt and herring; released one wild king salmon, one small chinook sampled
6/23	15:02	2	46°42.423	124°9.3678	54.79	whitebait smelt and a bit of herring; small pacific cod
6/23	19:43	3	46°31.9241	124°8.795	54.53	all escaped net but looked like herring; mostly jellies and some surf smelt
6/24	9:00	1	46°21.1721	124°6.9421	55.97	lots of herring
6/24	9:58	2	46°18.9005	124°6.705	56.96	lots of anchovies
6/24	16:26	3	46°2.8609	123°58.166	55.51	50/50 mix of herring and sardines; approx. 200 lbs released alive
6/25	10:00	1	45°42.6464	123°57.1838	50.93	mostly jellies; some herring and market squid; about 300 lbs of jellies released
6/25	12:17	2	45°40.1608	123°58.9104	53.67	all jellies; 2 herring sampled; about 50 lbs of jellies released
6/25	17:36	3*	45°23.8399	123°59.561	54.6	nearly all herring and one sardine; released about 7000 lbs alive; 1 salmon (unknown species) was released
6/26	9:36	1	45°8.9965	124°0.084	53.13	mix of herring (80%) and sardine (20%); about 900 lbs released alive
6/26	14:35	2	44°53.7324	124°3.5987	51.67	mostly herring with some jellies; about 10000 lbs released alive
6/27	13:23	1	44°23.6622	124°8.0728	51.37	sunk the corks; all fish got out; small squid, jellies, and whitebait smelt
6/27	18:26	2	44°5.3789	124°9.7771	52.69	herring, jellies, and ctenophores; 5000 lb released alive

Date	Time	Set	Latitude	Longitude	Water Temperature (°F)	Comments
6/28	8:36	1	43°59.1587	124°13.8376	53.08	jack mackerel and jellies with a couple squid and greenling; mystery rockfish
6/28	11:47	2	43°53.5172	124°13.5841	54.57	ctenophores and small squid
6/28	15:57	3*	43°44.6049	124°17.442	55.09	ctenophores and squid; 1 king salmon released alive
6/28	18:46	1*	43°35.5813	124°14.5701	53.64	Herring, squid, jellies, and lamprey; 1 king salmon released alive
6/29	9:02	1	43°23.4498	124°22.1066	52.96	all jellies; dumped
6/29	13:00	2	43°10.1318	124°25.5709	53.32	Jellies, sandlance, and jack mackerel; about 300 lbs released alive
6/29	17:51	3	42°59.59	124°37.9207	55.64	all jellies; dumped
7/1	10:57	1	42°0.014	124°15.406	55.03	moon jellies (95%) and ctenophores (4%); very small squid and sea nettles
7/1	12:47	2	42°3.417	124°25.58	52.79	jack mackerel and ctenophores
7/2	10:05	1	44°43.4693	124°25.5568	59.97	one sardine and market squid; pomfret
7/3	7:45	1*	46°48.2618	124°10.3547	56.09	Herring, one small chinook in sample

Table 3. Total weight and number of each species kept for biological information by date and set.

Date	Set	Species	Weight (g)	Number
6/21/2019	1	Market Squid	436	15
6/21/2019	1	Surf Smelt	475	11
6/21/2019	2	Miscellaneous Jellies	1896	
6/21/2019	2	Surf Smelt	36	1
6/21/2019	2	Whitebait Smelt	3820	636
6/22/2019	1	Miscellaneous Jellies	1732	
6/22/2019	1	Whitebait Smelt	628	98
6/22/2019	2	Black Rockfish	2170	1
6/22/2019	2	Chum Salmon	42	1
6/22/2019	2	Krill	60	

Date	Set	Species	Weight (g)	Number
6/22/2019	2	Miscellaneous Jellies	3592	
6/22/2019	2	Pacific Whiting	<2	1
6/22/2019	3	Chinook Salmon	162	5
6/22/2019	3	Northern Anchovy	34	4
6/22/2019	3	Pacific Cod	210	7
6/22/2019	3	Pacific Herring	6566	177
6/22/2019	3	Surf Smelt	44	1
6/22/2019	3	Whitebait Smelt	172	30
6/23/2019	1	Chinook Salmon	18	1
6/23/2019	1	Dungeness Crab	14	1
6/23/2019	1	Miscellaneous Jellies	764	
6/23/2019	1	Pacific Cod	6	3
6/23/2019	1	Pacific Herring	3310	97
6/23/2019	1	Starry Flounder	248	1
6/23/2019	1	Surf Smelt	36	1
6/23/2019	1	Whitebait Smelt	4560	916
6/23/2019	2	Miscellaneous Jellies	126	
6/23/2019	2	Pacific Cod	23	13
6/23/2019	2	Pacific Herring	188	6
6/23/2019	2	Whitebait Smelt	3998	782
6/23/2019	3	Miscellaneous Jellies	1014	
6/23/2019	3	Pacific Herring	35	1
6/23/2019	3	Surf Smelt	294	7
6/24/2019	1	Miscellaneous Jellies	3360	
6/24/2019	1	Northern Anchovy	34	1
6/24/2019	1	Pacific Herring	7778	169
6/24/2019	1	Starry Flounder	376	3
6/24/2019	2	Miscellaneous Jellies	472	
6/24/2019	2	Northern Anchovy	7958	208
6/24/2019	2	Starry Flounder	660	1
6/24/2019	2	Whitebait Smelt	33	7
6/24/2019	3	Greenling Spp.	2	1
6/24/2019	3	Miscellaneous Jellies	162	
6/24/2019	3	Pacific Herring	4854	140
6/24/2019	3	Pacific Sardine	3969	102
6/24/2019	3	Whitebait Smelt	572	94
6/25/2019	1	Market Squid	1108	44

Date	Set	Species	Weight (g)	Number
6/25/2019	1	Miscellaneous Jellies	2016	
6/25/2019	1	Pacific Herring	1332	36
6/25/2019	3	Miscellaneous Jellies	190	
6/25/2019	3	Pacific Cod	2	1
6/25/2019	3	Pacific Herring	10106	281
6/25/2019	3	Pacific Sardine	56	1
6/25/2019	3	Whitebait Smelt	224	35
6/26/2019	1	Miscellaneous Jellies	940	
6/26/2019	1	Pacific Herring	7272	223
6/26/2019	1	Pacific Sardine	1520	45
6/26/2019	2	Miscellaneous Jellies	2780	
6/26/2019	2	Pacific Herring	7338	173
6/27/2019	1	Market Squid	258	56
6/27/2019	1	Whitebait Smelt	118	17
6/27/2019	2	Market Squid	2	1
6/27/2019	2	Miscellaneous Jellies	1968	
6/27/2019	2	Pacific Herring	5222	135
6/28/2019	1	Greenling Spp.	4	1
6/28/2019	1	Jack Mackerel	17478	15
6/28/2019	1	Market Squid	30	8
6/28/2019	1	Rockfish Unident.	10	5
6/28/2019	2	Market Squid	906	91
6/28/2019	2	Miscellaneous Jellies	2512	
6/28/2019	3	Market Squid	2416	200
6/28/2019	3	Miscellaneous Jellies	4420	
6/28/2019	4	Market Squid	330	63
6/28/2019	4	Miscellaneous Jellies	20485	
6/28/2019	4	Pacific Herring	1855	48
6/28/2019	4	Pacific Lamprey	386	1
6/29/2019	2	Flatfish Spp.	<2	1
6/29/2019	2	Jack Mackerel	5246	4
6/29/2019	2	Market Squid	390	46
6/29/2019	2	Miscellaneous Jellies	5124	
6/29/2019	2	Pacific Tomcod	13	6
6/29/2019	2	Sandlance	494	32

Date	Set	Species	Weight (g)	Number
6/29/2019	2	Surf Smelt	119	7
6/29/2019	2	Whitebait Smelt	112	16
7/1/2019	2	Jack Mackerel	30185	25
7/2/2019	1	Leptocephalus Larve	4	1
7/2/2019	1	Market Squid	918	73
7/2/2019	1	Pacific Sardine	214	1
7/2/2019	1	Pacific Tomcod	<2	1
7/2/2019	1	Pomfret	656	5
7/2/2019	1	Rockfish Unident.	10	3
7/2/2019	1	Snailfish	4	1
7/3/2019	1	Pacific Herring	8280	183
7/3/2019	1	Shad	138	1